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A Comparison of the Nutritional Status and Food Security of Drug-Using and Non-Drug-Using Hispanic Women in Hartford, Connecticut

DAVID A. HIMMELGREEN,[1,2]* RAFAEL PÉREZ-ESCAMILLA,[3]
SOFIA SEGURA-MILLÁN,[1] NANCY ROMERO-DAZA,[1]
MIHAELA TANASESCU,[3] AND MERRILL SINGER[1]
[1]*Hispanic Health Council, Hartford, Connecticut 06106*
[2]*Department of Anthropology, University of South Florida, Tampa, Florida 33620*
[3]*Department of Nutritional Sciences, University of Connecticut, Storrs, Connecticut 06269*

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ABSTRACT This study compared food insecurity, nutritional status (as measured through anthropometry and dietary intake), and food preparation patterns of low-income Puerto Rican female out-of-treatment drug users with that of low-income Puerto Rican women who reported no drug use. A convenience sample of 41 drug users was compared with 41 age-matched non-drug-users from inner-city Hartford, Connecticut. A culturally appropriate food frequency questionnaire was administered and anthropometric measurements were taken. The findings suggest a high degree of poverty among all study participants, but in particular among drug users. Drug users were more likely than the controls to be food insecure ($P < 0.05$) and to be exposed to increasingly severe food sufficiency problems. The daily frequency of consumption of vegetables was lower ($P = 0.03$) for drug users than non-drug-users. Conversely, the frequency of consumption for sweets/desserts was significantly higher for drug users than the controls ($P = 0.0001$). Drug users, who were classified as food insecure were less likely to consume vegetables ($P = 0.004$) and fish ($P = 0.03$) than were controls who were food insecure. When comparing drug users with controls, the former group reported consuming fewer meals during a usual week than the latter group ($P < 0.0001$). Drug users were more likely to fry foods ($P = 0.02$) while the controls were more likely to bake ($P = 0.005$), boil ($P = 0.02$), and steam ($P = 0.002$) foods. All anthropometric measurements, except for height, were significantly lower for drug users. The results show that drug users generally maintain poorer nutritional status than non-drug-users. Nutrition interventions as part of drug treatment are needed. Am J Phys Anthropol 107:351–361, 1998.

With the exception of alcohol, there is limited research on the nutritional effects of recreational drug use and on the extent to which nutrition plays a role in the health of drug users (Heathcoote and Taylor, 1981; Sherlock, 1984; Johnson et al., 1994). This void exists in spite of the fact that drug

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*Correspondence to: David A. Himmelgreen, Department of Anthropology, University of South Florida, 4202 East Fowler Ave, SOC 107, Tampa, Florida 33620–8100.

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users, in particular injection drug users (IDUs), are at a heightened risk for malnutrition (Nyswander, 1956; El Nakah et al., 1979; Morabia et al., 1989; Mohs et al., 1990) and infectious diseases such as tuberculosis, sexually transmitted diseases (STDs), hepatitis B and C, and HIV (Louria et al., 1967; Blanck et al., 1980; Stoneburner et al., 1988). The information that does exist on drug use and nutrition comes predominantly from research on individuals who are about to begin or are already attending drug treatment programs (e.g., heroin detoxification and methadone maintenance). In general, the data show that the main factors associated with malnutrition include: drug-induced anorexia, changes in dietary patterns associated with drug dependency and the associated lifestyle (e.g., eating disorders, cravings, and snacking), poverty, and infectious disease (Nyswander, 1956; Louria et al., 1967; El Nakah et al., 1979; Blanck et al., 1980; Heathcoote and Taylor, 1981; Sherlock, 1984; Stoneburner et al., 1988; Morabia et al., 1989; Mohs et al., 1990; Johnson et al., 1994).

Studies of heroin users have shown low intakes of vitamin A, iron, thiamin, ascorbic acid, and calcium; replacement of food rich in fat and animal proteins with carbohydrate-laden foods; cravings for sweets; consumption of less than the recommended number of servings for fruits and vegetables; weight loss; low body mass index (BMI); protein energy malnutrition; higher and delayed insulin response; and altered glucose tolerance and metabolism (Gambera and Krohn Clarke, 1976; Somogyi and Kopp, 1989; Mohs et al., 1990; Varela et al., 1990). Cocaine abuse has been associated with anorexia, nutrient imbalance, increased consumption of alcohol and coffee, an increase in fatty food intake, and eating disorders (e.g., bulimia and anorexia nervosa) (Castro et al., 1987; Mohs et al., 1990). Chronic alcohol consumption has been related to vitamin, mineral, and protein deficiencies; a decline in the nutritional quality of the diet; and the impairment of digestion, nutrient absorption, and the utilization of nutrients (Gambera and Krohn Clarke, 1976; Roe, 1985). Marijuana use has been shown to increase appetite and food intake (Mohs et al., 1990).

Considering that the synergism between malnutrition, immune function, and infectious disease is well documented (Chandra and Newberne, 1977; Martorell and Habicht, 1986) but that there are few studies of active out-of-treatment drug users, more research is needed on this high-risk population. In particular, more attention needs to be given to minority female drug users, a notably understudied population (Weeks et al., 1996).

The purpose of this article is to present findings from Project SANA, Salud y Nutrición en Adicción (Health and Nutrition in Addiction), an exploratory study to assess nutritional status and health of low-income Puerto Rican women who use illicit drugs. The specific aim is to compare the anthropometry and dietary patterns of low-income out-of-treatment drug users with age-matched low-income controls who do not use illicit drugs. The main hypothesis tested is that out-of-treatment drug users will have poorer nutritional status indicators (i.e., anthropometry and dietary intake) and will be more likely to experience food insecurity than the control group.

MATERIALS AND METHODS

Subjects

The study was conducted between July and September 1996, covering the period when seasonal foods such as fruits and vegetables were most likely to be available. The vast majority of participants (84%) were interviewed in August and September. Twenty percent were interviewed during the first 10 days of the month, 38% were interviewed during days 11 through 20, and 42% were interviewed between days 21 and 30 or 31. Lower participation at the beginning of the month was attributed to participant involvement in other activities, such as the cashing of government assistance checks and the purchase of food and goods.

The targeted convenience sample included 41 female drug users and 41 age- and gender-matched controls who were non-drug-users. To qualify, participants had to be: 1) Puerto Rican, 2) between the ages of 18 and 44 years, 3) not pregnant at the time of inter-

view, 4) receiving or eligible to receive income assistance or food assistance targeting the poor (e.g., Aid to Families with Dependent Children (AFDC), Food Stamps, the Special Supplemental Food Program for Women, Infants, and Children (WIC)), and 5) a parent with children under 18 years of age. To be classified as a drug user, participants had to self-report illicit drug use (e.g., intravenous drug injection of heroin, smoking or snorting of crack cocaine, oral ingestion of amphetamines) during the previous 30 days. Although drug use was not verified by toxicological analysis, the interviewers were trained to identify characteristics associated with this practice (e.g., needle tracks on arms and legs, lethargy, sweating, chills, hyperactivity, and paranoia).

Methodology

Trained bilingual outreach workers recruited participants for the study from Hispanic Health Council programs and through street outreach. Only the selection criteria, as outlined above, were used to identify potential participants. Outreach workers were specifically instructed not to use physical characteristics such as being a "thin" drug user or "fat" control for inclusion in the study. Even though the participants were not randomly chosen (due to the fact that female drug users are a hard-to-reach and a often hidden population), key characteristics (i.e., sociodemographics and drug use patterns) were similar to those reported in other larger scale studies of low-income drug using and non-drug-using Latinos in Hartford (Singer et al., 1992; Himmelgreen, 1995; Weeks et al., 1996; Pérez-Escamilla et al., 1997). All the participants received a $10 cash incentive and a package of nutritional information with an explanation of all the materials.

The instrument included information on sociodemographics, food and income assistance, food sources, transportation, food security and hunger, a food frequency questionnaire (FFQ) that contained ethnic foods and dishes, health information, and drug use (i.e., types and frequency of use). Finally, in-depth ethnographic interviews, which are the subject of another article (Romero-Daza et al., 1998), were conducted with 15 of the drug using women to examine qualitatively the impact of drug abuse on dietary patterns and the effect of specific drugs on women's food habits.

Food insecurity has been defined as "whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain" (Life Sciences Research Organization, 1990:1559–1560). To estimate the prevalence of food insecurity and hunger, the Radimer/Cornell scale was administered to participants who were not homeless and who had children living with them at the time of the study (the scale was designed for households with caretakers with children) (Radimer et al., 1990, 1992; Kendall et al., 1996; Frongillo et al., 1997). The scale has been shown to be valid among rural white households (Radimer et al., 1992; Kendall et al., 1996; Frongillo et al., 1997) and, more recently, was effectively applied to low-income Hispanics in Hartford, Connecticut (Pérez-Escamilla et al., 1997; Himmelgreen et al., 1997, under review).

In the conceptualization of the Radimer/Cornell Scale, "food insecurity is [viewed as] a managed process with a general sequence of events as the problem worsens. Household food insecurity [the households of the drug users and the controls] is experienced first, followed by compromises in the quality and quantity of food eaten by adults [the drug users and controls]. Child hunger, characterized by decreases in the quantity of food eaten by children [the children of the drug users and the controls], is the last stage, representing the most severe problem with household food sufficiency" (Kendall et al., 1996:1020). The scale includes 10 items (see Kendall et al. (1996) for a description of these items) and examines food insecurity in the context of four components: the quantity of food, the quality of food, the certainty of getting food, and food acceptability.

A food frequency questionnaire (FFQ) containing nearly 200 foods, including 30 Puerto Rican traditional dishes, was administered to both the drug users and controls. Respondents were asked to report the usual frequency of consumption of each food, which could be reported on a daily, weekly, monthly, or yearly basis. In reporting this way, data

on foods that were consumed frequently (e.g., rice and beans) and infrequently (e.g., salted cod fish and tamarind) over the course of a year could be captured. The frequency of consumption for all these foods was reported in times per day by dividing by 7, 30, and 365, the weekly, monthly, and yearly frequencies, respectively. Foods not consumed were assigned a frequency of "zero." The foods included in the FFQ were collapsed into 12 composite groups based on their relevance for Puerto Ricans. Some of these included starchy vegetables such as viandas (e.g., yucca, breadfruit, taro root, and yams), dairy products (e.g., whole milk and cheese), grains (e.g., rice and tortillas), sweets (e.g., chocolate, hard candies), and desserts (e.g., pastries, ice cream, and custard/flan). Additionally, a condensed FFQ was administered to each participant and compared for consistency with the longer FFQ. The condensed FFQ contained 13 food groups (i.e., fruit; legumes; starchy vegetables; green leafy vegetables and others; dairy products; meats; fish and shellfish; eggs; pasta, breads and cereals; fruit juices; soft drinks; sweets and desserts; snack foods). Participants were provided with examples of specific foods in each food group (beans and chickpeas in the legumes group).

The validity of the FFQ for estimating food and nutrient intakes (with the exception of some nutrients such as vitamin A) has been demonstrated (Willett, 1998; Willett et al., 1985; Mullen et al., 1984; Morgen et al., 1978). The long FFQ used in this study, which was also successfully applied in a community needs assessment of low income Puerto Rican children and adults in Hartford (Pérez-Escamilla et al., 1997), was developed by interviewing key community informants and was pretested by applying it to at least five target individuals not included in the study. The content validity of this instrument was ascertained by nutritionists and anthropologists knowledgeable of the Latino culture in general and the Puerto Rican culture in particular. As such, the long FFQ captures those foods consumed by the larger community as well as the foods that are culturally relevant to Puerto Ricans. While we have not as of yet measured the absolute validity of this instrument, it is unlikely that there were instrument biases in the between-group comparisons. First, the directionality and significance of the between-group comparisons is similar when applying the condensed and the longer FFQs. Second, the dietary findings corroborate the anthropometric and food insecurity findings indicating that drug users are worse off nutritionally than the controls. Third, the FFQ results were highly consistent with the literature and our own ethnographic studies of this same sample. For example, drug users were more likely to consume sweets/desserts, while the controls were more likely to consume more vegetables. Thus, we conclude that the use of the FFQ is a valid way to compare the diets of drug users and controls. Future studies are needed to examine the validity of this FFQ to provide absolute estimates of food intakes by Puerto Rican women.

The participants were also asked to report the number of meals they consumed during a usual week and the different methods of food preparation they use (e.g., frying, baking, grilling). We also asked them about food purchasing patterns (i.e., buying food at a supermarket, local market (bodega), and convenience store).

Anthropometric measures of weight, height, four skinfolds (i.e., biceps, triceps, subscapular, suprailiac), and mid-upper arm circumference were taken using standard techniques (Weiner and Lourie, 1981; Gibson, 1990). A Health-o-meter professional floor dial scale was used for body weight (without outer garments). This reading was measured to the nearest pound and converted to kilograms. A Perspective adult/infant portable measurement board was used to measure height (without shoes) to the nearest 0.1 cm; mid-upper arm circumference was measured to the nearest 0.1 cm using an Ensure inser-tape; the triceps, biceps, subscapular, and suprailiac skinfolds were measured to the nearest mm, using a Lange skinfold caliper. In addition to body mass index (BMI) (weight/height^2), arm fat index (AFI), upper arm fat area (UFA), and upper arm muscle area (UMA) were

calculated using the following formulae (Frisancho, 1996):

Total Upper Arm Area (TUA)

$$= C^2/(4 \times 3.14)$$

where C= mid-upper arm circumference

Upper Arm Muscle Area (UMA)

$$= [C - (Ts \times 3.14)]^2$$

where Ts = triceps skinfold thickness

Upper Arm Fat Area (UFA) = TUA − UMA

Arm Fat Index (AFI) = (UFA/TUA) × 100

Since Hispanics exhibit a tendency for centripetal fat deposition (Georges et al., 1993), a combination of limb and trunk measurements may have been preferable. However, because modesty was an important cultural factor among the participants, trunk measures were not included in the protocol.

Statistical analysis

Chi-square analysis was used to compare drug users and controls for categorical variables such as birth place, level of education completed, employment status, and government assistance (i.e., food stamps and Aid for Dependent Families (AFDC)). Student's *t*-tests were used to compare the two groups for other sociodemographic variables (i.e., age and number of children), anthropometry, frequency of meal consumption, and food intake. Since the standard deviations for some of the data on food groups (e.g., soft drinks and fruit juice) were large, the Mann-Whitney U statistic was used to compare food intake rank-ordered data between the drug users and controls. A *P*-value ≤ 0.05 was considered statistically significant. Statistical analyses were done using SPSS for Windows (v. 7.5).

RESULTS

Sociodemographics, assistance, and food purchasing

Table 1 shows that, when compared to the controls, drug users were more likely to have been born in the U.S. (32% vs. 12%), to have been homeless at some point during their lives (66% vs. 22%), and to have been homeless at the time of the interview (24% vs. 0%). Conversely, drug users were less likely than the controls to have graduated from high school (25% vs. 54%) and to have received AFDC (65% vs. 95%) and food stamps at the time of the study (77% vs. 95%). The average number of children for both groups was 3.3 ± 1.4; however, fewer drug users reported having any children living with them at the time of the study (78% vs. 100%). Moreover, drug users reported significantly ($P < 0.005$) fewer children (1.6 ± 1.3) living with them than did the controls (3.0 ± 1.4). Finally, fewer drug users than controls had access to a phone (37% vs. 76%), stove/burner (85% vs. 100%), and a car (9% vs. 34%). The differences between the two groups for these sociodemographic characteristics may be explained partly by the high prevalence of self-reported homelessness for drug users.

Although more drug users (43.9%) than controls (31.7%) reported using emergency food assistance at some point during their lives, this difference was not statistically significant. Ninety-six percent of the controls and 92% of the drug users reported purchasing most of their food from supermarkets. Eight percent of the drug users re-

TABLE 1. Characteristics of participants (n = 82)

	Drug users		Controls		
	N	(%)	N	(%)	*P*-value
Born in USA	13	(31.7)	5	(12.2)	0.03
Single/never married	22	(53.7)	18	(43.9)	NS
Ever homeless	27	(65.9)	9	(22.0)	0.0001
Currently homeless	9	(24.3)	0	(0)	0.002
High school graduate	10	(24.4)	22	(53.7)	0.007
Employed	2	(4.9)	6	(14.6)	NS
Received AFDC	26	(65.0)	38	(95.0)	0.001
Received Food Stamps	30	(76.9)	39	(95.0)	0.02
Access to car	3	(7.3)	14	(34.1)	0.003
Access to stove/ burner	35	(85.4)	41	(100)	0.01
Access to phone	15	(36.6)	31	(75.6)	0.0001
Emergency food assistance	18	(43.9)	13	(31.7)	NS
	Mean	S.D.	Mean	S.D.	
Age (yrs)	33.5	5.7	33.1	5.1	NS
# Children	3.3	1.4	3.3	3.0	NS

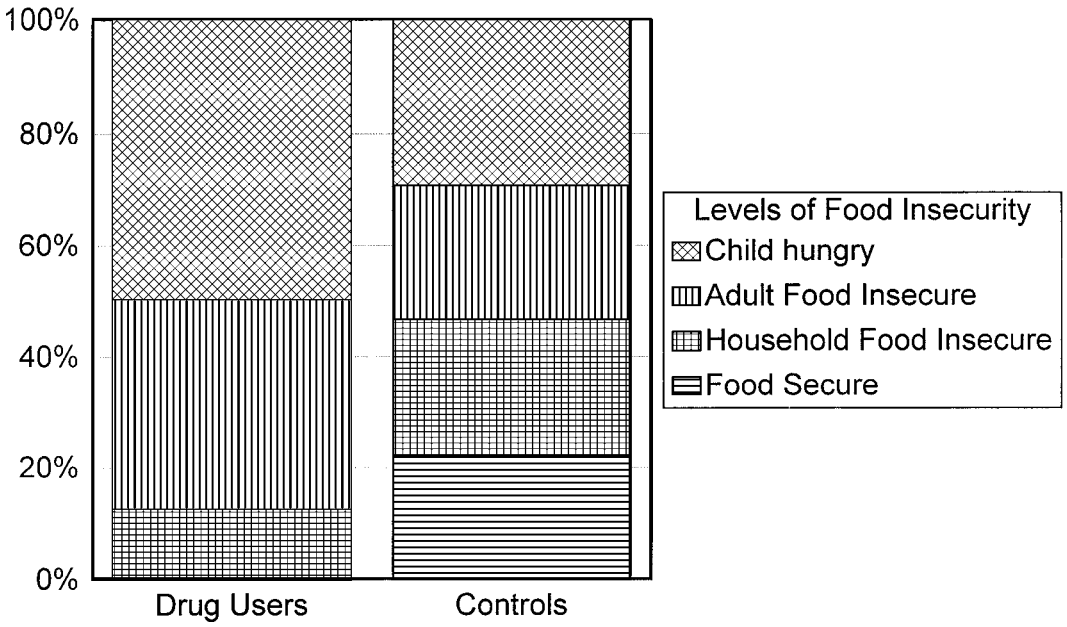

Fig. 1. Levels of food insecurity as defined by the Radimer/Cornell scale.

ported that most of their food purchases were made at small neighborhood markets (e.g., bodegas) and convenience stores, while 6% of the controls reported that they used supermarkets, small markets, and convenience stores for most food purchases.

Drug use patterns

In the drug-using group, a pattern of multiple drug use was found, with cocaine, heroin, and speedballs (a mixture of heroin and cocaine) as the most frequently used substances. About 29% of the drug users reported mainly injecting drugs such as heroin, cocaine, and speedballs; 10% reported primarily snorting or smoking crack cocaine; and 54% indicated that they both injected and smoked/snorted drugs. The remaining drug users reported other types of drug ingestion, such as the oral consumption of pills. Crack cocaine users reported using the drug an average of 20.7 $\pm$ 12.3 days during the month prior to the interview. Injection drug users reported, on average, 140.6 $\pm$ 125.6 injections during the previous month. Thirty-five percent of the drug users also reported regular use of marijuana, usually in combination with alcohol, and less frequently with tranquilizers such as xanax and valium. These patterns of drug consumption match those of larger samples of drug users recruited in our city-wide targeted sampling studies of drug use and AIDS risk (Singer et al., 1992; Himmelgreen, 1995; Weeks et al., 1996).

Food insecurity

Figure 1 shows the findings on food insecurity and hunger. Since the Radimer/Cornell scale can only be applied to women with children, only 32 (78%) of the drug users were eligible to answer questions in the scale as compared to all of the controls. As shown, none of the drug users fell in the food secure group (compared to 22% of the controls). Drug users were more likely than controls to be classified in the adult food insecure (37.5% vs. 24.4%; $P < 0.05$) and child hungry groups (50% vs. 29.2%; $P < 0.005$). In other words, drug users were more likely than the controls to experience food insecurity. The drug users were also more likely than the controls to have children who were periodically hungry, according to the Radimer/Cornell scale.

TABLE 2. Frequency of food consumption (times/day) (n = 82)

Foods	Drug users Mean	(S.D.)	Controls Mean	(S.D.)	*P*-value
Fruits	2.3	(2.1)	2.2	(1.7)	0.92
Fruit juice	1.2	(1.6)	1.5	(1.7)	0.41
Vegetables	2.1	(2.5)	3.2	(2.2)	0.03
Starchy vegetables	0.2	(0.3)	0.2	(0.4)	0.94
Bread, breakfast cereals, rice, pasta	3.0	(3.4)	2.8	(2.3)	0.82
Meat	1.7	(1.2)	1.9	(0.6)	0.54
Eggs	0.7	(0.8)	0.4	(0.3)	0.08
Legumes	0.9	(0.6)	1.2	(1.2)	0.08
Fish	0.3	(0.3)	0.3	(0.2)	0.79
Dairy Products	1.9	(1.8)	2.0	(1.8)	0.88
Sweets/desserts	1.8	(1.7)	0.7	(0.8)	0.0001
Soft drinks	2.1	(2.2)	1.8	(2.3)	0.59

Reported frequency of consumption over the past year.

TABLE 3. Ranked data for the frequency of food consumption (times per day) (n = 82)

Foods	Drug users Median (M.R.)	Controls Median (M.R.)	*P*-value
Fruits	1.3 (40.4)	2.0 (42.6)	0.69
Fruit juice	0.7 (39.0)	1.0 (44.1)	0.33
Vegetables	1.4 (33.1)	2.5 (49.9)	0.001
Starchy vegetables	0.1 (39.1)	0.1 (44.0)	0.35
Bread, breakfast cereals, rice, pasta	1.9 (39.2)	2.3 (43.8)	0.39
Meat	1.6 (37.7)	1.7 (45.3)	0.15
Eggs	0.4 (43.2)	0.4 (38.4)	0.52
Legumes	1.0 (38.1)	0.9 (45.0)	0.24
Fish	0.2 (38.0)	0.3 (45.0)	0.19
Dairy Products	1.4 (40.3)	1.5 (42.7)	0.64
Sweets	1.7 (49.6)	0.3 (33.4)	0.002
Soft drinks	1.0 (43.2)	1.0 (39.8)	0.52

Mann-Whitney test on ranked data; M.R. = mean rank.

Frequency of food consumption, meal consumption, and food preparation

There was great similarity in the frequency of consumption for most food groups when comparing the short and longer FFQs. The findings for the longer FFQ are provided below, except where noted. As can be seen in Table 2, the daily frequency of consumption of vegetables, as derived from the FFQ, was significantly lower for the drug users (2.1 ± 2.5) than for the controls (3.2 ± 2.1). Specifically, the consumption of carrots, corn, cabbage, cucumber, avocado, and potatoes was significantly lower among the former group, while the consumption of traditional starchy vegetables (e.g., yucca, breadfruit, yams, and taro root) was similar between the two groups. The frequency of consumption for the sweets/desserts food group was not significantly different between the drug users (4.5 ± 5.2) and the controls (3.7 ± 2.9), although the former did report a higher frequency. However, when the condensed FFQ was analyzed, drug users consumed significantly more sweets/desserts (1.8 ± 1.7) than did the controls (0.7 ± 0.8; $P = 0.0001$). When specific foods within the sweets/desserts food group of the longer FFQ were compared, the drug users were more likely than the controls to consume custard and ice cream ($P = 0.008$); fruit jello ($P = 0.017$); fruit cocktail ($P = 0.016$), and cookies ($P = 0.043$). Conversely, the controls were more likely than the drug users to consume foods such as honey and peanut butter. The consumption of foods such as peanut butter provide a hidden source of sugar, but are not necessarily viewed as a sweet or dessert. By including them in the sweets/desserts food group of the longer FFQ, the differences in the frequency of consumption of this food group was obscured.

The Mann-Whitney U statistic was used to analyze the median values for each food group. Table 3 shows that while vegetable consumption is significantly lower among the drug users (median = 1.4) than the controls (median = 2.5; $P = 0.001$), the consumption of sweets/desserts is significantly higher (median = 1.7 vs. 0.3; $P < 0.002$).

The consumption of vegetables was significantly lower among food insecure drug users (1.7 ± 1.25) than among food insecure controls (3.2 ± 2.3; $P = 0.004$). Food insecure drug users were also less likely to consume fish (0.2 ± 0.1) than food insecure controls (0.3 ± 0.2; $P = 0.03$). When comparing homeless with nonhomeless drug users, there were no significant differences for the frequency of consumption for any of the food groups. This may be explained by the fact that both of these groups showed similar rates of use of soup kitchens, food pantries, and other sources of emergency food. The same pattern was found when examining food group intake by access to a car, phone, and stove/burner.

TABLE 4. Anthropometric nutritional status

Measures	Drug users (n = 41) Mean	(SD)	Controls (n = 41) Mean	(SD)	*P*-value
Height (cm)	156.6	(6.3)	156.7	(6.3)	0.98
Weight (kg)	59.6	(19.2)	70.1	(19.7)	0.018
BMI (wgt/hgt2)	24.8	(10.5)	28.5	(7.6)	0.012
UAC (cm)	27.8	(5.3)	31.2	(5.3)	0.005
Subscapula (mm)	15.2	(9.4)	22.7	(9.4)	0.001
Triceps (mm)	18.6	(9.8)	20.3	(10.2)	0.001
Suprailiac (mm)	13.1	(9.9)	20.3	(10.2)	0.002

UAC = upper arm circumference; BMI = body mass index.

TABLE 5. Upper arm muscle, fat area, and fat index

	Drug users Mean	(SD)	Controls Mean	(SD)	*P*-value
Total upper arm area (TUA)	63.8	(26.9)	79.9	(29.1)	0.0001
Upper arm fat area (UFA)	24.8	(17.9)	36.7	(18.4)	0.004
Upper arm muscle area (UMA)	39.0	(10.5)	43.3	(11.9)	0.011
Arm fat index (AFI)	35.7	(10.9)	43.9	(8.8)	0.08

The mean number of meals consumed in a week was 11.4 ± 4.9 for the drug users and 15.6 ± 4.6 for the controls ($P < 0.0001$), with 22% of the drug users reporting seven or fewer meals per week. Drug users reported consuming fewer breakfasts (3.8 ± 2.7; $P < 0.0001$) and dinners (5.9 ± 2.3) than did controls (5.4 ± 2.3 for breakfasts and 6.6 ± 1.4 for dinners). When involved in food preparation, drug users were more likely to fry their foods (4.8 ± 2.3 times/week) than were controls (3.6 ± 2.3 times/week; $P = 0.02$). Conversely, the controls were more likely than drug users to bake (2.6 ± 2.2 times/week vs. 1.3 ± 1.6 times/week for drug users; $P = 0.005$), boil (3.3 ± 2.2 times/week vs. 2.1 ± 2.3 times/week for drug users; $P = 0.02$) and steam their foods (3.5 ± 2.2; $P = 0.002$ vs. 0.5 ± 1.0 times/week for drug users).

Anthropometry

Table 4 shows that drug users had significantly lower measures for body weight; mid-upper arm circumference; and subscapular, triceps, and suprailliac skinfolds ($P = 0.002$) than the controls. Moreover, BMI was lower among drug users than among controls, with 24% of the former group compared to 7% of the latter group having a BMI of less than 20. In general, it was found that the majority of anthropometric measures among the drug users varied between the 15th and 50th percentiles, while those of the controls varied between the 50th and 75th percentiles when compared to data from NHANES I and II. An exception to this pattern was that height in both groups varied between the 15th and 25th percentiles.

Data on total upper arm area and upper arm fat and muscle areas are given in Table 5. As shown, most of these measures, in particular those estimating upper arm fat area (UFA and AFI), were significantly lower for the drug users. Finally, drug users were much more likely than controls to report losing weight during the past year (44% vs. 13%, respectively; $P < 0.05$).

DISCUSSION

Considering that Hartford is the eighth-poorest moderate-sized city in the U.S., with nearly 28% of its residents living in poverty, it is not surprising that unemployment is so high among this targeted sample (90%). These findings demonstrate a high degree of poverty among all the study participants, but especially among drug users, who were more likely than non-drug-users to be unemployed, homeless, and receiving government assistance (e.g., food stamps and AFDC). The drug users reported a pattern of multiple drug use, with cocaine, heroin, and speedball being the most frequently cited choice of drugs. Over one-third also reported using marijuana, usually in combination with alcohol and sometimes with tranquilizers. Although this was a convenience sample, its sociodemographic characteristics and drug-related behaviors are similar to those found in larger studies among drug users in Hartford (Singer et al., 1992; Himmelgreen, 1995; Weeks et al., 1996).

According to the Radimer/Cornell scale, which classifies subjects into mutually exclusive groups representing increasingly severe food sufficiency problems, drug users were more likely than controls to be food insecure. For example, 37.5% of the drug

users (as compared to 24.4% of the controls) experienced deficiencies in both the quantity and quality of their diets during the previous year. While data on food insecurity for the controls is similar to that found among other low-income Hispanic women in Hartford (Himmelgreen et al., under review), the findings for the drug users show significantly higher prevalence of hunger and food insecurity and underscore the magnitude of the problem with food sufficiency for these women.

Some of the findings from the FFQ are also of interest. On the one hand, drug users reported a statistically significant lower frequency of consumption of vegetables. On the other hand (after removing foods such as peanut butter and honey, but keeping other foods such as cookies, fruit jello, fruit cocktail, and custard and ice cream), the consumption of the sweets/desserts food group was significantly higher among drug users than among the controls. These data suggest that the drug users were more likely than the controls to consume foods that are clearly identified as being confections and/or desserts. Moreover, in our ethnographic data drug users cited candy, chocolate, and ice cream as the foods desired to satisfy a craving for sugar. One participant even reported that when the craving for sweets came on she would eat sugar by itself. Considering that the vast majority of these drug users used heroin, this latter finding corroborates the literature showing a linkage between heroin use and cravings for sweets (Mohs et al., 1990).

Although egg consumption was not significantly different between the two groups ($P = 0.08$), drug users did report consuming them more frequently than did the controls. Our ethnographic data also suggest that drug users often preferred eggs as a source of protein in their diets. This may be explained by the fact that the cost of eggs is relatively low (when compared to meat and poultry). Since drug users were more likely than the controls to be food insecure and living in conditions of severe poverty, it may be that this difference in egg consumption reflects the drug users efforts to economize. Other data on low-income populations in Hartford also show a similar finding (Himmelgreen et al., 1997). Finally, the preference for eggs among drug users may be explained by the fact that they are easy to prepare and that the drug users were more focused on satisfying their drug needs than taking time out in the day to prepare different foods or meals.

The data also showed that drug users consumed significantly fewer meals than the controls; the ethnographic interviews corroborate this observation and support the contention that, with the exception of sweets and desserts, there was a general disinterest in eating and lack of appetite (Romero-Daza et al., 1998). Conversely, some drug users reported using marijuana to stimulate appetite in an attempt to maintain health and physical appearance. Interestingly, being homeless was not associated with food intake among the drug users. These findings may be attributed to the fact that the generally accepted definition of homelessness was used where an individual could be living on the streets, in a shelter, or someone else's place. It is very likely that very few of these drug users were living on the streets and, thus, probably had similar access to food as the nonhomeless drug users, especially through soup kitchens and food pantries.

Drug users were more likely to fry their foods, while the controls were more likely to bake, boil, and steam. As illustrated by the ethnographic data (Romero-Daza et al., 1998), the fact that the drug users preferred frying over these other methods may be indicative of the need to spend a minimal amount of time in food preparation. Overall, the vast majority of drug users and controls purchased most of their food from supermarkets and a small number from each group reported buying most of their food from local bodegas and convenience stores. Hartford, like other economically depressed cities in the Northeast, has seen a drastic reduction in the number of supermarket chains, from a high of 13 in 1968 to only 2 in 1996. The lack of competition within the city has resulted in Hartford food prices being up to 35% higher than in the outlying suburbs (Advisory Commission on Food Policy, 1996). The lack of supermarkets in the city, the fact that it is not easy to get transportation to the outlying suburbs (where food is less expensive), and the higher cost of food within the city is likely to constrain the ability of

these low-income drug users and controls to access a low-cost healthy diet for themselves and for their children.

All anthropometric measures except for height were significantly lower among the drug users. In fact, nearly one-quarter of drug users had a BMI of 20 or less, indicating underweight (Gibson, 1990). Estimates of upper arm fat and muscle areas were also significantly lower among the drug users. For most anthropometric measures, the drug users ranged between the 15th and 50th percentiles, while the non-drug-users ranged between the 50th and 75th percentiles when compared to the national sample from NHANES. These data support the general finding in the literature that drug users are at risk for undernutrition (Roe, 1985; Mohs et al., 1990; Varela et al., 1990; Gelberg et al., 1995). Furthermore, the data for the control women are similar to those found at the national level, showing a higher than average prevalence for overweight and obesity among U.S. Hispanic women when compared to whites (Morbidity and Mortality Weekly Report, 1997).

In 1990, the American Dietetic Association (ADA) declared that "nutrition intervention, planned and provided by a nutrition professional, is an essential component of treatment and recovery from chemical dependency" (ADA, 1990:1274).In issuing this statement, the ADA emphasized that improvement of nutritional status in combination with other treatment modalities could enhance the overall efficacy of drug treatment and help to prevent drug relapse. Diet modification and balanced eating patterns not only contribute to improving health, but may also aid in drug rehabilitation by providing an avenue for drug users to take charge of their lives by focusing on "good eating" as a means to achieving rehabilitation (Mohs et al., 1990).

The Centers for Disease Control recently reported that deaths from AIDS in the U.S. during last year continued to fall (*New York Times,* 1997). Overall, the decline was 19% and was found in all regions, ethnic groups, and among IDUs. However, while the number of deaths among women dropped for the first time, this decrease was only 7% as compared to 22% for men. The drug-using women in Project SANA represent an especially high risk group. Their poverty, coupled with poor nutrition, can affect the normal functioning of the immune system and places them at increased risk for infection. Additionally, drug-related behaviors such as direct and indirect syringe sharing heighten this risk because of the potential transfer of infectious agents. In light of the high prevalence of HIV and other infectious diseases among IDUs, it is highly desirable that drug treatment programs and HIV/AIDS prevention programs emphasize both protective behaviors in drug injection and the practice of good nutrition. Finally, since nutritional status plays an important role in host resistance, and may be a cofactor in modifying the course HIV-1 infection, more programs need to be developed for both out-of-treatment and in-treatment drug users living with HIV.

The findings presented here represent a first step in developing a longitudinal study to examine the synergism between poverty, drug use, nutrition, and susceptibility to infection among out-of-treatment drug users. Ultimately, we seek to use this information in the development of culture-appropriate nutrition intervention that could be incorporated into drug treatment, HIV/AIDS prevention, street health outreach, syringe exchange, homeless shelters, drop-in centers, community-based health promotion programs, and primary care clinics and related efforts that serve drug using populations. It is recognized that under conditions of severe poverty and the pressing demand of drug addiction, merely teaching culturally appropriate approaches to good nutrition is unlikely to be an adequate intervention. Consequently, the ultimate objective must be the implementation of comprehensive programs that address the interlocked health threats examined in this article.

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